PA[T])NT COOPERATION TREAT[Y])

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark Office, PCT
2011 South Clark Place Room CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing: 23 August 2001 (23.08.01)	
International application No.: PCT/AU00/00107	Applicant's or agent's file reference: IRN 634287
International filing date: 16 February 2000 (16.02.00)	Priority date:
Applicant: MELROSE, Graham, John, Hamilton et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International preliminary Examining Authority on:

27 April 2000 (27.04.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer:

J. Zahra

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
IRN 634287		
International Application No.	International Filing Date *(day/month/year)*	Priority Date *(day/month/year)*
PCT/AU00/00107	16 February 2000	16 February 2000
International Patent Classification (IPC) or national classification and IPC		
Int. Cl. [7] C08F 16/34, 16/38, 116/34, 116/38, 216/34, 216/38; C08L 29/00; A01N 35/02		
Applicant		
CHEMEQ LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

[X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[X]	Certain observations on the international application

Date of submission of the demand	Date of completion of the report
27 April 2000	22 March 2001
Name and mailing address of the IPEA/AU	Authorized Officer
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	**DR. A. TESSEMA** Telephone No. (02) 6283 2271

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/AU00/00107

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed.

☒ the description, pages **1, 2, 4-7, 9-17,** as originally filed;
pages , filed with the demand,
pages **3, 8,** received on **14 March 2001** with the letter of **13 March 2001**
page **18,** received on **20 November 2000**

☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **19-21 ,** received on **14 March 2001** with the letter of **13 March 2001**

☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-19	YES
	Claims		NO
Inventive step (IS)	Claims	1-19	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-19	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

NOVELTY; INVENTIVE STEP: Claims 1-19

No document or combination of documents cited in the international search report disclose the invention defined in any one of amended claims 1-19. The closest prior art is WO 00/03723 which discloses a method for the preparation of compositions of poly(2-propenal, 2-propenoic acid) (acrolein polymer).Example 8(a) of this citation discloses the antimicrobial activity of the polymer wherein the polymer is dissolved in polyethylene glycol and the composition is heated at 70°C. The resulting composition is then poured into water at room temperature. The difference between the citation and the claimed invention is that, unlike the citation, the polymer of the claimed invention is dissolved in a mixture of water or aqueous solution of , for example, sodium carbonate and a hydroxylic solvent such as polyethylene glycol (see claim 1; page 3, lines 17-25; examples 2 and 6). The polymeric solution of the claimed invention is heated from 40°C to 150°C in the presence of both water and the hydroxylic solvent; this feature is not disclosed in the citation. Therefore, present claims 1-19 satisfy the PCT requirements of novelty and inventive step.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. Page 3, lines 26 and 27 , is not clear because of the term " the polymers" which should be " the solution " (see page 3, line 24 and the claims).

2. Claim 19 is unclear because of the term " preservative disinfectant or antiseptic or composition " which should be, in view of page 5, lines 4-9, " preservative or disinfectant or antiseptic compound or composition ".

It is a further object of the present invention to provide methods of preparing compositions, these methods producing a new configuration of the subject polymers and in particular of poly(2-propenal, 2-propenoic acid), and which better retain antimicrobial activity.

It is a still further object of the present invention to provide methods of preparing compositions, these methods producing a new configuration of the subject polymers and in particular of poly(2-propenal, 2-propenoic acid), and which contain less free acrolein.

It is a yet still further object of the present invention to provide compositions containing a new configuration of the subject polymers and in particular of poly(2-propenal, 2-propenoic acid) which are efficacious disinfectants or antiseptics.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

DISCLOSURE OF THE INVENTION

In accordance with the present invention there is provided a method for improving the antimicrobial activity of a polymer derived from acrolein monomer wherein the polymer has been oxidized in air to form an oxidised acrolein polymer comprising carboxyl groups, said method comprising:

providing a solution of the oxidized acrolein polymer comprising carboxyl groups in a mixture containing water and a hydroxylic solvent including an alcohol selected from the group consisting of polyols, polyethylene glycols and alkanols; and

heating the solution at a temperature in the range of from 40 to 150°C for a period sufficient to improve the antimicrobial activity of the acrolein polymer.

Still preferably, the polymers are heated in the range of 40 to 115°C.

Still further preferably, the polymers are heated in the range of 70 – 90°C.

inoculated sample to 9 mL of letheen broth and vortex. Plate out serial 1 in 10 dilutions. Pour with tryptone soya agar. Incubate 3 days at 37°C.

EXAMPLE 1

The example describes a method of preparing a poly(2-propenal, 2-propenoic acid) by oxidation of a solid acrolein polymer in air. This poly(2-propenal, 2-propanoic acid) is the preferred method of preparing a starting material for use in the method of the invention. Water (720 mL at ambient temperature, about 20°C) and acrolein (60g; freshly distilled, plus hydroquinone added to 0.25% w/w) were placed in an open beaker, within a fume cupboard, and very vigorously stirred, mechanically. Then, 0.2 M aqueous sodium hydroxide (21.4 mL) was added to bring the pH to 10.5 – 11.0. The solution immediately turned a yellow typical of the hydroquinone anion and within a minute, the colour had disappeared and the clear solution became milky. About 1 minute later, precipitation of a white crystalline, flocculent polymer began, and appeared complete within 15-30 minutes. The precipitate was filtered and washed with water (250 mL), dried at room temperature upon filter papers for 2 days (yield 25g), then spread as a thin layer in glass petri dishes and heated at 40°C/8 hours. This heating was continued at the following schedules : 50°C/15 hours; 65°C/4 hours; 75°C/18 hours; 84°C/24 hours.

It is envisaged that this method may be scaled-up to include, eg the stepwise addition of acrolein, in a closed vessel, and followed by more rapid drying.

Typically, a solution of the resulting poly(2-propenal, 2-propenoic acid) was prepared by adding 2g of the subject polymer, with stirring over 15-30 minutes, to a 1% w/w aqueous sodium carbonate solution (100 mL), and then diluted as required. Such solutions were perfectly clear – in contrast to attempted dissolutions, using alternatively, polymer derived from Example 5 of 11686/95; compare Example 5, hereinafter.

EXAMPLE 2

(a) 5g of poly(2-propenal, 2-propenoic acid) was dissolved in 64g polyethylene glycol ("PEG") 200 and combined with 31g of a 0.71% solution of sodium carbonate. A portion of the solution (apparent pH=5.8) was retained at room

Table 12

	Cfu/mL *	
Treatment Time (days)	Treated Tower	Control Tower
1	2.4×10^3	1.1×10^7
2	2.0×10^3	1×10^6
3	3.3×10^3	-
4	2.5×10^3	-
14	6.1×10^4	2.6×10^6
15	5.1×10^4	1.1×10^6
16	5.1×10^4	4.9×10^6

* Colony forming units/mL

The data indicate the treatment programme maintained the microbial counts within the guidelines of AS/NZ Standard 3666.3(Int):1998 and below that in the adjacent tower, containing biodispersant (which was found to be unusually inadequate during the demanding conditions of the very hot, summer period of the test).

Modifications and variation such as would be apparent to the skilled addressee are considered to fall within the scope of the present invention.

CLAIMS

1. A method for improving the antimicrobial activity of a polymer derived from acrolein monomer wherein the polymer has been oxidized in air to form an oxidised acrolein polymer comprising carboxyl groups, said method comprising:

providing a solution of the oxidized acrolein polymer comprising carboxyl groups in a mixture containing water and a hydroxylic solvent including an alcohol selected from the group consisting of polyols, polyethylene glycols and alkanols; and

heating the solution at a temperature in the range of from 40 to 150°C for a period sufficient to improve the antimicrobial activity of the acrolein polymer.

2. A method according to claim 1 wherein said oxidised polymer comprising carboxyl groups is formed by a method of heating a solid acrolein polymer in air at an elevated temperature to form carboxyl groups.

3. A method according to claim 2 wherein said acrolein polymer comprising carboxyl groups has been formed by heating in air at a temperature between 80°C and 100°C.

4. A method according to claim 2 wherein the acrolein polymer comprising carboxyl groups has been formed by heating in air at a temperature of about 85°C.

5. A method according to claim 1 wherein the pH of the solvent is in the range of from 7 to 9.

6. A method according to claim 1 wherein the pH of the solvent is about 8.

7. A method according to claim 2 or claim 3 wherein the solvent includes an alkali selected from an alkali hydroxide, alkali carbonate and mixtures thereof.

8. A method according to claim 2 or claim 3 wherein the alkali is sodium hydroxide, sodium carbonate or mixture thereof.

9. A method according to claim 1, characterised in that the solution is heated in the range of 40 to 115°C.

10. A method according to claim 1, characterised in that the solution is heated in the range of 70-115°C.

11. A method according to claim 9 wherein the solution is heated to about 100°C.

12. A method according to any one of claims 1 to 3, characterised in that the solution is heated for a period of between 1 to 1,400 hours, thereby increasing antimicrobial activity of the polymers.

13. A method according to any one of the preceding claims, characterised in that the solution is heated for a period in the range of from 4 to 60 hours.

14. A method according to claim 11, characterized in that the hydroxylic solvent is polyethylene glycol and is present in the solution in an amount of between 50 and 99% by weight of the solution.

15. A method according to claim 14, characterized in that polyethylene glycol is present in the solution in an amount of between 64 and 95% by weight of the solution.

16. A method according to any one of the preceding claims, characterized by the addition of base or alkali to the polymers before and/or during heating, thereby enhancing the antimicrobial activity of the polymers.

17. A method according to any one of the preceding claims, characterised in that the release of free acrolein monomer by the acrolein polymer is reduced.

18. An antimicrobial compound or composition prepared by the method of any one of the preceding claims.

19. A preservative·disinfectant or antiseptic or composition prepared wholly or in part by the method of any one of claims 1 to 16.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70) 14

Applicant's or agent's file reference IRN 634287	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. **PCT/AU00/00107**	International Filing Date *(day/month/year)* 16 February 2000	Priority Date *(day/month/year)* 16 February 2000
International Patent Classification (IPC) or national classification and IPC **Int. Cl.** [7] C08F 16/34, 16/38, 116/34, 116/38, 216/34, 216/38; C08L 29/00; A01N 35/02		
Applicant CHEMEQ LTD et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   [X] This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheet(s).

3. This report contains indications relating to the following items:

I	[X]	Basis of the report
II	[ ]	Priority
III	[ ]	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	[ ]	Lack of unity of invention
V	[X]	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	[ ]	Certain documents cited
VII	[ ]	Certain defects in the international application
VIII	[X]	Certain observations on the international application

Date of submission of the demand 27 April 2000	Date of completion of the report 22 March 2001
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer **DR. A. TESSEMA** Telephone No. (02) 6283 2271

INTERNATIONAL PRELIMIN[redacted] EXAMINATION REPORT

[redacted]ational application No.
PCT/AU00/00107

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed.

☒ the description, pages **1, 2, 4-7, 9-17,** as originally filed,
pages , filed with the demand,
pages **3, 8,** received on **14 March 2001** with the letter of **13 March 2001**
page **18,** received on **20 November 2000**

☒ the claims, pages , as originally filed,
pages , as amended (together with any statement) under Article 19,
pages , filed with the demand,
pages **19-21** , received on **14 March 2001** with the letter of **13 March 2001**

☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of

☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, was on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/fig.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	**1-19**	**YES**
	Claims		**NO**
Inventive step (IS)	Claims	**1-19**	**YES**
	Claims		**NO**
Industrial applicability (IA)	Claims	**1-19**	**YES**
	Claims		**NO**

2. Citations and explanations (Rule 70.7)

NOVELTY: INVENTIVE STEP: Claims 1-19

No document or combination of documents cited in the international search report disclose the invention defined in any one of amended claims 1-19. The closest prior art is WO 00/03723 which discloses a method for the preparation of compositions of poly(2-propenal, 2-propenoic acid) (acrolein polymer).Example 8(a) of this citation discloses the antimicrobial activity of the polymer wherein the polymer is dissolved in polyethylene glycol and the composition is heated at 70^{0}C. The resulting composition is then poured into water at room temperature. The difference between the citation and the claimed invention is that, unlike the citation, the polymer of the claimed invention is dissolved in a mixture of water or aqueous solution of , for example, sodium carbonate and a hydroxylic solvent such as polyethylene glycol (see claim 1; page 3, lines 17-25; examples 2 and 6). The polymeric solution of the claimed invention is heated from 40^{0}C to 150^{0}C in the presence of both water and the hydroxylic solvent; this feature is not disclosed in the citation. Therefore, present claims 1-19 satisfy the PCT requirements of novelty and inventive step.

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. Page 3, lines 26 and 27 , is not clear because of the term " the polymers" which should be " the solution " (see page 3, line 24 and the claims).

2. Claim 19 is unclear because of the term " preservative disinfectant or antiseptic or composition " which should be, in view of page 5, lines 4-9, " preservative or disinfectant or antiseptic compound or composition ".